

Some fruit bats (Chiroptera, Pteropodidae) of the Mamberamo River Basin, West Papua, Indonesia

FREDDY PATTISELANNO¹

Four species of fruit bats (Order Chiroptera, Family Pteropodidae) are recorded for the first time from the lowland forests of the Mamberamo River Basin in the northwest region of New Guinea Island. These are *Syconycteris australis* (common blossom bat), *Nyctimene albiventer* (common tube-nosed fruit bat), *N. draconilla* (dragon tube-nosed fruit bat) and *Paranyctimene raptor* (unstriped/lesser tube-nosed fruit bat). A total of 66 individuals were captured using mist-nets set up in the Furu River site (20 net-nights) and Tiri River site (15 net-nights) near Dabra town, West Papua, Indonesia from September 1-15, 2000.

KEY WORDS: fruit bats, Pteropodidae, Chiroptera, distribution range, reproduction, ecology, conservation status, Mamberamo River Basin, West Papua, New Guinea Island, Indonesia

INTRODUCTION

New Guinea which is the second largest island in the world after Greenland - with a total land area of 800,000 km², is known as an island of contrasts and diversity (Gressitt 1982). West Papua (formerly known as Irian Jaya) on New Guinea Island is recently considered a global priority area for biodiversity conservation, due in part to the high species richness in its forest environment and many unique New Guinean species. The island contains Australo-papuan fauna that represents taxa originating from both Southeast Asia and Australia (Robbins 1971 as cited by McPhee 1988).

¹Animal Science Laboratory, Papua State University, Gunung Salju Amban St., Manokwari 98314 West Papua, Indonesia. *Present address:* Institute of Animal Science, College of Agriculture, University of the Philippines Los Baños, College, Laguna 4031, Philippines. *E-mail address:* fpattiselanno@yahoo.com

West Papua probably represents one of the highest levels of diversity and endemism of flora and fauna in Indonesia. About 146 mammals, 329 reptiles and amphibians and 650 birds inhabit its diverse ecosystems. Its total of 1,125 vertebrate species represent more than 50% of Indonesia's terrestrial vertebrate fauna (Conservation International 1999).

West Papua has a wide variety of ecosystems situated from coastal to highland areas, providing specific habitats for many endemic mammals (Petocz 1994). It is bisected by mountains from east to west, and is also laced by deep valleys and rivers. The Mamberamo River watershed, one of the wetland sites in West Papua, covers 7,711,602 hectares and includes part of the central mountains of New Guinea, as well as lowland forests, coastal forests and tropical marshlands. According to Polhemus and Richards (2002), it is the largest watershed in northern Papua, draining catchment that encompasses all northward flowing streams descending from New Guinea's central mountains between the Papua New Guinea border and 137° West longitude.

At present, this potential marshland area in West Papua is classified in part as a production forest (31.6%), conversion forest (29.6%), protected forest (29.6%) and other categories (1.4%). In the past, a development project by the Department of Research and Technology proposed a construction of a dam in this area for the program of the Industrial and Agricultural Center in West Papua. At that time, there were no available studies on the environment of the region (which has a global importance for the conservation of flora and fauna) or the possible impacts of the dam project on the environment (Anonymous 1998). The value of this ecosystem in terms of biological conservation is quite obvious, and if construction of a dam at this point of passage through the Foja/Van Rees Mountains is completed then this will represent a major ecological catastrophe for Papua's biodiversity (Polhemus & Richards 2002).

About 155 species of mammals are present in the wetlands of West Papua, including some globally threatened and protected fruit bat species (Wibowo & Suyatno 1998). Some important or threatened wildlife species that are found in the Mamberamo River catchment area include the following: two crocodiles (*Crocodylus porosus* and *C. novaeguinae*), grizzled tree-kangaroo (*Dendrolagus inustus*), bandicoot (*Echymipera clara*), spotted cuscus (*Spiloglossus rufoniger*), cassowary (*Casuaris* sp.), bird-of-paradise (*Paradisea minor*) and wild pig (*Sus scrofa*) (Anonymous 1998, Wibowo & Suyatno 1998).

Most information about the bats of West Papua is largely derived from Bonaccorso (1998) and Flannery (1994), which summarize the distribution of bats on the island of New Guinea. The latest review on the global conservation status of bats by Mickleburgh *et al.* (2002) indicates that Papua New Guinea has a total number of 91 bat species, 19 of which are endemic. According to Bonaccorso (1998), out of the 49 fruit bat species present in Indonesia, about 14 are West Papuan endemics. Furthermore, Eastern West Papua has, by far, the third highest world score for fruit bat biodiversity (IUCN 1992). However, the bat fauna of West Papua has not been well documented and thus, is poorly known. The Mamberamo River basin, which is a lowland rainforest on the northern side of West Papua (Figure 1) is one such area.

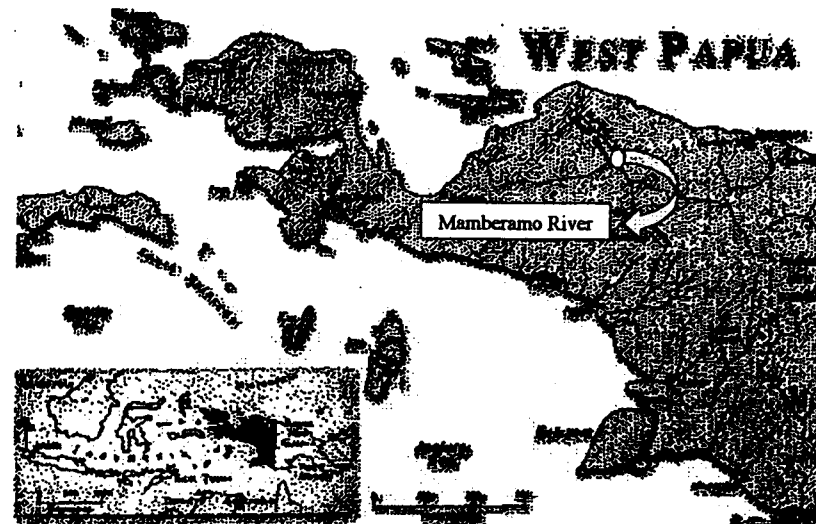


Figure 1. Geographical map of West Papua Province showing the relative location of the study sites.

Fruit bats play an important role in seed dispersal and pollination of many tropical trees, which helps maintain plant diversity in forest ecosystems. Many megachiropterans or fruit bats feed exclusively on the fruit and flower of chirotophilous trees. Fruit bats fly over wide distances to forage and often disperse plant seeds to new places and habitats. Several tropical species such as the African baobab tree and the Australian ironwood rely largely on fruit bats to pollinate them or disperse their seeds. In other words, bats are beneficial to man in terms of pollination or seed dispersal of many economically important plants like durian, bananas and figs (Wiles & Fujita 1992).

With these benefits in mind, the present study aims to document the distribution of fruit bats in important forest areas of West Papua and make comparison among lowland forest habitats in the New Guinea islands.

MATERIALS AND METHODS

Bats were collected using mist-nets set up on two study sites in the lowland rainforests of the Mamberamo River basin near the town of Dabra, West Papua, Indonesia (see Figures 1 & 2) from September 1-15, 2000. Sampling was conducted in seven nights, with bats netted for four nights in the Furu River site (3°16' 592" S, 138° 38' 294" E) and for three nights in the Tiri River site (3°17' 595" S, 138°34' 835" E). Five black mist-nets with a mesh size of 36 mm, height of 2.5 m and width of 6 m were set

on each study site, in selected potential foraging areas (ridges, clearings, patches of forest growth and along the stream) and possible flyway paths of bats. Nets were set 2-3 m high while the bottom edge of each net was set generally 0.4-0.5 m above the ground.

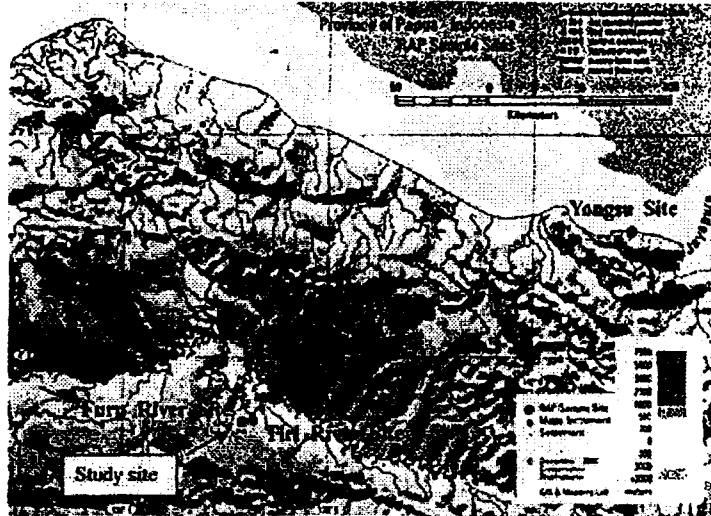


Figure 2. Map of West Papua showing location of Furu River and Tiri River study sites in Mamberamo River Basin. (Courtesy of Conservation International GIS Mapping Laboratory, 2000).

Mist-nets were opened at 1700H and checked regularly at 2100, 0100 and 0500H to retrieve captures. Each captured bat was identified using the taxonomic description given by Bonaccorso (1998) and Flannery (1994). Body measurements and weights were taken using a caliper and spring scale, respectively. The number of species and individuals per study site were recorded to calculate the netting success. Netting success by species and by captures were obtained by calculating the total number of species and total number of individuals netted over the total number of net-nights accumulated on each site, *i.e.* 20 and 15 net-nights in Tiri and Furu, respectively.

After identification and measurement, eight individuals (each species represented by a pair of male-female) were collected as voucher specimens while the rest were released. The voucher specimens are now deposited at the Museum Zoology Bogoriense (MZB) of the Indonesian Institute of Sciences (LIPI) in Bogor, Indonesia.

Generally, the study sites where the survey was conducted are within a peat swamp forest with an area of 432,750 ha. Both study sites (Furu and Tiri) are described as lowland swampy area surrounded by primary rainforest and are close to a small stream that leads to the Mamberamo River, which is the major river in this area. The vegetation found in this area is much more varied, ranging from tall, mixed species forest near rivers through low, open canopy forest of mixed *Pandanus* species to

Fruit bats of West Papua

herbaceous swamp dominated by sedges, reeds and floating grasses. The climate is typically dry from May to September followed by a rainy season. Year-round temperatures reach into the high 80s (°F) during the day. The survey was conducted during the dry season when water levels in the main river channel and its tributaries were relatively low.

Furu River Site. The presence of pioneer tree species such as *Macaranga mappa*, *Nauclea orientalis*, *Endospermum peltatum*, *Cananga odorata*, *Duabanga moluccana* showed that the forest at Furu has been subjected to low-medium level of disturbance. The Dabra community uses the area for hunting wild animals and collecting minor forest products, and their main impact appears to be the felling of trees to collect matoa fruits (*Pometia* spp., Sapindaceae). The vegetation along the riverbank is dominated by *Mitragyna speciosa*, *Planchonia cf. valida*, *Leucosyke capitellata*, *Dracontomelon dao*, *Homalium foetidum*, and *Croton* spp. (de Fretes *et al.* 2002).

Tiri River Site. According to de Fretes *et al.* (2002), the forest canopy at Tiri is mainly formed by *Pometia pinnata*, *Heritiera littoralis*, *Intsia palembanica*, *I. bijuga* and *Garcinia latissima*. Some species found on the forest floor are *Leptaspis urceolata* and species belonging to the following genera: *Elatostema*, *Rhaphidophora*, *Mapania*, *Piper* and *Freycinetia*. The species that are commonly found along the riverbanks are *P. pinnata*, *Terminalia* sp., *Chisocheton ceramicus*, *Aglaia argentea*, *H. littoralis*, *Ficus* sp., *Octomeles sumatrana* and *Canarium acutifolium*.

RESULTS

A total of 66 individuals of fruit bats belonging to four species of the Family Pteropodidae, Order Chiroptera were captured from the two study sites in Mamberamo River Basin in West Papua, Indonesia from September 1-25, 2000. These four fruit bat species include the common blossom bat (*Syconycteris australis papuana* Peters 1867), common tube-nosed fruit bat (*Nyctimene albiventer* Gray 1863), dragon tube-nosed fruit bat (*Nyctimene draconilla* Thomas 1922) and unstriped/lesser tube-nosed fruit bat (*Paranyctimene raptor* Tate 1942). Table 1 provides a summary of number

Table 1. Summary of fruit bats netted in Tiri and Furu River sites in the Mamberamo River Basin, West Papua, Indonesia; September 1-15, 2000.

Taxon	Study Site							
	Site 1 - Tiri River				Site 2 - Furu River			
	♂	♀	♀P*	Total	♂	♀	♀P	Total
<i>Syconycteris australis papuana</i>	10	3	1	14	8	6	0	14
<i>Nyctimene albiventer papuanus</i>	7	6	0	13	3	0	0	3
<i>Nyctimene draconilla</i>	5	1	8	14	1	0	0	1
<i>Paranyctimene raptor</i>	2	0	1	3	2	1	1	4
Total of individuals	24	10	10	44	14	7	1	22
Netting success by species (%)	20	15	15	20	26.6	13.3	6.7	26.6
Netting success by capture (%)	120	50	15	220	93.3	46.6	6.7	146.7

*♀ P = pregnant bats captured in the study sites

of fruit bats netted in both Tiri River and Furu River sites while Table 2 shows the data on body measurements, weights, sex and age of these fruit bats.

Table 2. Biometric data for the 66 individuals of fruit bats (Chiroptera, Pteropodidae) captured at the Furu River and Tiri River study sites, Mamberamo River Basin, West Papua, Indonesia from September 1-25, 2000.

No.	Taxon	Biometric parameter ¹								
		WT	HB	TL	HF	TB	FA	E	Sex	Age
Furu River Study Site										
3	<i>Nyctimene albiventer</i>	24	80	16	8	22	51	14	♂	A
11	<i>N. albiventer</i>	26	76	13	13	23	54	13	♂	Y
18	<i>N. albiventer</i>	30	75	18	12	19	52	12	♀	Y
21	<i>N. albiventer</i>	24	73	15	11	25	54	12	♂	Y
23	<i>N. albiventer</i>	34	82	20	11	20	50	13	♂	A*
33	<i>N. albiventer</i>	26	81	15	13	23	54	11	♂	A
34	<i>N. albiventer</i>	34	73	22	11	20	62	11	♀	A
38	<i>N. albiventer</i>	30	78	20	14	24	56	15	♀	A*
39	<i>N. albiventer</i>	24	77	22	12	22	55	14	♂	Y
40	<i>N. albiventer</i>	30	83	18	12	24	52	12	♀	A
41	<i>N. albiventer</i>	28	84	17	12	22	49	13	♂	A
42	<i>N. albiventer</i>	30	82	15	13	23	51	14	♀	Y
43	<i>N. albiventer</i>	24	80	20	13	22	51	15	♀	A
4	<i>Nyctimene draconilla</i>	28	72	15	12	21	51	12	♂	A/P
5	<i>N. draconilla</i>	31	84	16	12	22	62	13	♂	A*
10	<i>N. draconilla</i>	36	79	15	10	23	51	13	♀	A/P
12	<i>N. draconilla</i>	28	77	20	12	22	61	14	♀	A/P
16	<i>N. draconilla</i>	32	83	15	13	23	52	12	♀	A/P
17	<i>N. draconilla</i>	28	75	16	12	18	53	12	♀	A/P*
20	<i>N. draconilla</i>	36	77	17	13	19	52	12	♀	A/P
22	<i>N. draconilla</i>	30	76	20	14	22	55	12	♀	A*
35	<i>N. draconilla</i>	32	78	17	14	21	57	15	♀	A/P
44	<i>N. draconilla</i>	26	83	20	11	23	54	13	♀	Y
26	<i>N. draconilla</i>	32	75	14	12	22	51	12	♂	A/P
27	<i>N. draconilla</i>	30	65	15	11	22	51	11	♂	A
28	<i>N. draconilla</i>	28	69	15	11	19	52	14	♂	A
29	<i>N. draconilla</i>	32	82	15	14	21	55	13	♀	A/P
2	<i>Paranyctimene raptor</i>	18	65	14	10	18	48	10	♂	Y
14	<i>P. raptor</i>	20	65	12	10	18	50	10	♀	A/P*
25	<i>P. raptor</i>	18	69	16	10	18	46	12	♂	A

Table 2. Cont.

1	<i>Syconycteris australis</i>	18	68	-	11	12	41	12	♂	Y
6	<i>S. australis</i>	20	69	-	6	19	48	11	♂	A
7	<i>S. australis</i>	15	66	-	8	18	43	13	♂	A
8	<i>S. australis</i>	18	61	-	11	18	40	12	♂	Y
9	<i>S. australis</i>	16	68	-	12	18	41	14	♂	A
13	<i>S. australis</i>	16	60	-	9	16	45	9	♂	A
15	<i>S. australis</i>	16	56	-	12	18	39	13	♂	A
19	<i>S. australis</i>	13	60	-	9	15	36	10	♀	A
24	<i>S. australis</i>	16	54	-	9	15	41	14	♂	A*
30	<i>S. australis</i>	20	52	-	12	20	45	9	♂	A/P
31	<i>S. australis</i>	12	53	-	10	13	45	12	♀	Y
32	<i>S. australis</i>	16	62	-	12	17	44	14	♂	A
36	<i>S. australis</i>	12	52	-	16	17	32	13	♀	Y
37	<i>S. australis</i>	22	65	-	16	19	38	14	♀	A/LP
Tiri River Study Site										
52	<i>N. albiventer</i>	30	76	13	12	18	50	12	♂	A
56	<i>N. albiventer</i>	32	82	12	11	20	50	13	♂	A
58	<i>N. albiventer</i>	28	74	18	11	20	53	13	♂	A
54	<i>N. draconilla</i>	30	70	16	12	22	57	11	♂	A
45	<i>P. raptor</i>	14	65	15	11	17	48	10	♀	Y
53	<i>P. raptor</i>	22	72	14	10	19	48	12	♂	A*
59	<i>P. raptor</i>	24	72	17	11	19	48	11	♀	A/P
63	<i>P. raptor</i>	22	76	11	10	18	48	11	♂	Y
46	<i>S. australis</i>	12	60	-	9	13	38	11	♂	A
47	<i>S. australis</i>	18	62	-	10	15	42	12	♂	A
48	<i>S. australis</i>	12	61	-	11	15	40	10	♀	A/L*
49	<i>S. australis</i>	18	58	-	8	17	40	11	♀	A
50	<i>S. australis</i>	18	60	-	10	13	38	11	♂	A
51	<i>S. australis</i>	16	58	-	10	12	39	11	♂	A
55	<i>S. australis</i>	18	68	-	11	17	44	14	♂	A
57	<i>S. australis</i>	18	60	-	9	15	41	12	♀	A
60	<i>S. australis</i>	16	70	-	9	14	42	12	♂	Y
61	<i>S. australis</i>	18	66	-	9	14	42	12	♂	Y
62	<i>S. australis</i>	18	72	-	11	16	46	9	♀	Y

based from 4 to 3 captures, respectively. From the three females captured, two were pregnant and had young embryos.

Table 2. Cont.

64	<i>S. australis</i>	16	69	-	11	18	43	14	♂	A
65	<i>S. australis</i>	20	71	-	12	20	45	15	♀	A
66	<i>S. australis</i>	14	70	-	11	19	43	13	♀	Y

[†]WT = Weight (g); HB = Body Length (mm); TL = Tail Length (mm); HF = Hind foot (mm); TB = Tibia (mm); FA = Fore arm (mm); E = Ear length (mm); A = Adult; Y = Young; L = Lactating; P = Pregnant; * = deposited as voucher specimen at the Museum of Zoology Bogor (LIPI), Bogor, Indonesia.

Syconycteres australis is the most common species of fruit bats in West Papua, observed and captured almost every day (28 of 66 individuals or 42.4% of captured bats), with 14 individuals recorded each from Furu and Tiri River sites. Apparently, males composed most of the captures for *S. australis*, with 18 males netted in both sites compared to only 10 females. This represents a sex ratio of 1.8 males to 1 female of *S. australis* in both sites. In terms of age composition, 18 adults were captured for this species, with the remaining 10 individuals considered as juveniles or subadults. From the total of 10 females, only two exhibited breeding condition, with one pregnant carrying a single embryo and another was lactating.

Two species of tube-nosed fruit bats of the genus *Nyctimene* (*N. albiventer papuanus* and *N. draconilla*) are also widely distributed in the two study sites in West Papua. Both species are considered to be common, but not as common as *S. australis*. *Nyctimene albiventer* is considered fairly abundant in the Mamberamo River Basin (n = 16) representing 24.24% of total catch results in both Furu and Tiri River sites. The ratio of male to female was 1.67 males to 1 female based on 10 males and 6 females captured for both sites.

Nyctimene draconilla was regularly captured together with *N. albiventer*, and seemed to be equally common at both sites in Mamberamo River Basin sites. With a total of 15 individuals captured in both sites for this species representing 22.72% of the catch results. Similarly, *N. draconilla* is considered to be fairly abundant in both study sites of the Mamberamo River Basin. Only one male was netted after 15 net-nights in Tiri site and only five males and 9 females were netted in the Furu site. A resulting sex ratio of 1 male to 1.5 females was observed for both sites. Of the nine adult female *N. draconilla* netted at Furu site, eight were pregnant. This monotypic species is restricted to New Guinea Island and closely resembles *N. albiventer*.

Aside from the two *Nyctimene* species, *Paranyctimene raptor* was also netted during this survey in the Mamberamo River Basin. Also recognized as a monotypic species that is only distributed in New Guinea Island and Salawati Island. A total of seven individuals of *P. raptor* (or 10.60% of total) were captured in both Furu and Tiri sites. From these seven individuals, a sex ratio of 1.3 males to 1 female was obtained

DISCUSSION

Bonaccorso (1998) stated that 49 fruit bat species occurred in Indonesia, and 14 species are restricted only to West Papuan region. The latest review by Mickleburgh *et al.* (2002) indicated that Papua New Guinea (actually referring to the whole New Guinea Island including West Papua) is the habitat of 34 fruit bat species. Therefore, the four fruit bat species captured in the Mamberamo River Basin represent 11.76 of the total fruit bat species known to occur on New Guinea Island and 28.57% of the fruit bats known to be present in West Papua.

Syconycteres a. papuana is a subspecies endemic to New Guinea and its satellite islands. Its status is regarded to be common in New Guinea, being abundant in all altitudes (Flannery 1994). This being the case, this taxon is classified under priority grade 11 or 'not threatened' category of IUCN (IUCN 1992). Singadan *et al.* (2001) reported that this species occurs in Yongsu Region east of Mamberamo River Basin, near Jayapura and is widespread, ranging from 0 to 3000 m above sea level. *S. a. papuana* is also recorded during the mammal survey of the Wapoga River in Seiwa Wapoga, West Papua (Boeadi & Widodo 2000). According to McKean (1972), its reproduction appears to be seasonal in New Guinea and a single embryo per female is usual. The single pregnant female captured during this survey in September 2000 supports this seasonal breeding period in the Mamberamo River Basin. Richards (1983) cited this species to be important pollinators in the forest ecosystem because it almost feeds exclusively on nectar and pollen.

Both *Nyctimene* species reported in this study are extremely widespread throughout New Guinea and surrounding islands especially at low altitudes in both primary and secondary forests (Flannery 1994). At Yongsu Region of West Papua, Singadan *et al.* (2001) recorded *N. a. papuanus* only at 1500 m above sea level, although this fruit bat is known to occur from 15 to 900 m at the Kikori River Basin of Papua New Guinea (Leary & Seri 1997). *N. a. papuanus* is similarly widespread in the two sites at the Mamberamo River Basin. According to Bonaccorso (1998), the common tube-nosed fruit bat occupies sago palm swamp forest on New Guinea Island, which is similar to the habitat found in both study sites of this survey in the Mamberamo region. McKean (1972) noted that pregnant females caught in January, July and August on New Guinea Island had single embryo each. Apparently, more of the females captured in both study sites were pregnant during this survey in September 2000. Based on the study of Vestjens and Hall (1977), food items found in the stomach content of *N. a. papuanus* contained pulped vegetable matter supporting the claim that this species plays an important role as dispersal agent of plants in the forest ecosystem.

Nyctimene draconilla was formerly included as a subspecies of *N. albiventer* (IUCN 1992) but it is now considered as a distinct, sympatric species. Despite the fact that this species is widely distributed in New Guinea, it is classified as a rare species and placed under priority grade 6 of IUCN conservation status. Koopman

(1982) noted that *N. draconilla* had been recorded previously only in Lorentz River, West Papua and now known to occur in the Mamberamo River Basin based on this study. At Kiunga, Papua New Guinea, two specimens obtained were referred to this species (Flannery 1994). This species is not easily differentiated from *N. a. papuanus* and *P. raptor* especially in color variation. For example, the record from Raut village, West Sepik Province of Papua New Guinea identified as *N. draconilla* (Greig-Smith 1975) was later claimed as *P. raptor* (Flannery 1994). Results of this survey support the assumption that *N. draconilla* may be more abundant and widespread contrary to the status suggested by IUCN particularly because the information for the status of this species was limited then (IUCN 1992).

Flannery (1994) cited that *P. raptor* is uncommon in its distribution in New Guinea. This species was first collected in West Papua at Gelvink Bay, Nabire in 1969 and was also recorded from Salawati Island in 1992 (Bonaccorso 1998). It was also captured during the survey of Boeadi and Widodo (2000) at Seiwa Wapoga, West Papua. The present study extends its occurrence to the Mamberamo region, West Papua. Leary and Seri (1997) recorded one lactating, and five pregnant females with single embryo each were captured in March at the Kikori River basin. McKean (1972) collected pregnant females with single embryo each in January, February and May. In addition a female with a single embryo was caught by Greig-Smith (1975) in July-August, while Flannery (1994) netted two lactating females in May. These netting data for pregnant females including the one from Mamberamo River Basin (September) indicate that the reproduction period of *P. raptor* probably occurs throughout the year.

Table 3 provides a summary of previous locality records for the four bat taxa reported in this study. Based on these records, it is clear that the results from the Furu and Tiri River sites at Mamberamo River Basin, West Papua represent new locality records. However further investigation on the ecology, population biology and conservation status of these fruit bats should be done as a sound basis for any recommended action to curb the threats to these fruit bats in their habitats in the West Papua region and elsewhere.

Table 3. Previous locality records for the four bat taxa reported in the present study.

Taxon	Locality where recorded	Reference
<i>Syconycteris australis papuana</i>	New Guinea Island	Flannery 1994
	Seiwa Wapoga, West Papua	Boeadi & Widodo 2000
	Yongsu Jayapura, West Papua	Singadan <i>et al.</i> 2001
<i>Nyctimene albiventer papuanus</i>	Kikori River Basin, Papua New Guinea	Leary & Seri 1997
	Yongsu Jayapura, West Papua	Singadan <i>et al.</i> 2001
<i>N. draconilla</i>	Papua New Guinea	McKean 1972
	Fly River, Papua New Guinea	Koopman 1982
	Lorentz, West Papua	Koopman 1982
<i>Paranyctimene raptor</i>	Sepik District, Papua New Guinea	Greig-Smith 1975
	West Sepik Province, Papua New Guinea	Flannery 1994
	Kikori River Basin, Papua New Guinea	Leary & Seri 1997
	Nabire and Salawati, West Papua	Bonaccorso 1998
	Seiwa Wapoga, West Papua	Boeadi & Widodo 2000

Fruit bats of West Papua

In their review of the global conservation status of bats, Mickleburgh, *et al.* (2002) stated that Indonesia ranks number one in terms of total number of bat species (175) and total number of endemic species (54). Together with Papua New Guinea (total number of bat species 91 with 19 endemic) and Philippines (total number of bat species 70 with 20 endemic), the bat fauna in these areas often faces threats in the form of limited habitats owing to rapidly increasing human populations and occurrence of natural catastrophic events, *e.g.* cyclones and typhoons. Therefore, bat conservation action plan involving cave protection, educational campaign and legal protection of bats should be implemented immediately in these global conservation priority areas.

ACKNOWLEDGMENTS

The author would like to thank the Conservation International West Papua Program for financing the field study to the Mamberamo River Basin. Special thanks are due to the local field guide from Dabra, Mamberamo for providing useful collaboration during the fieldwork. The survey was made possible through the generous assistance from "Dewan Adat Mamberamo Raya" and the local communities around Tiri and Furu study sites.

The author is particularly thankful to: Ms. Rose K. Singadan (Biology Department, University of Papua New Guinea) for the invaluable advice and assistance during the fieldwork and specimen identification; Don E. Wilson (Smithsonian Institution, Washington DC, USA) and Paul A. Racey (Aberdeen University, UK) for their valuable comments on earlier drafts of this paper.

LITERATURE CITED

- Anonymous, 1998. The industrial and agricultural project in the Mamberamo river catchment area in the Indonesian province of Irian Jaya/West Papua. Compiled Information Paper of the Mamberamo Workshop, pp. 1-7. Jakarta, Indonesia, 7-8 April 1997 (unpublished).
- Boeadi and W.Widodo. 2000. Mammals of the Wapoga River area of northwestern Irian Jaya, Indonesia, pp. 22-23. *In*: Mack, A. and L. Alonso (eds.). RAP Bulletin of Biological Assessment of the Wapoga River area of northwestern Irian Jaya, Indonesia 14. Conservation International, Washington DC, USA.
- Bonaccorso, F.J. 1998. Bats of New Guinea. Conservation International, Washington DC, 489 p.
- Conservation International (CI). 1999. Final Report: Seminar on Priority Setting of Irian Jaya Biodiversity Conservation. Conservation International Indonesian Program.
- de Fretes, Y., I.A. Rachman and E. Wally. 2002. Vegetation of the Dabra Area, Mamberamo River Basin, Papua Indonesia. pp. 51-56. *In*: Richards, S.J. and S. Suryadi (eds.). A biodiversity assessment of Yongsu-Cyclops Mountains and the Southern Mamberamo Basin, Papua, Indonesia. RAP Bulletin of Biological Assessment 25. Conservation International, Washington, DC, USA.
- Flannery, T.F. 1994. Mammals of New Guinea. Revised and expanded edition. Reed Book, Chatswood, 464 p.
- Greig-Smith, P.W. 1975. Notes on collection of bats and their ectoparasites from the Sepik District, Papua New Guinea. *Science in New Guinea* 3: 117-122.
- Gressitt, J.L. (ed.). 1982. Biogeography and Ecology of New Guinea. *Monographiae Biologicae* 42: 1-983. Junk, The Hague.

- Koopman, K.F. 1982. Results of the Archbold Expeditions No. 109. Bats from east Papuan and the eastern Papuan islands. *American Museum Novitates* 2747: 1-34.
- Leary, T. and L. Seri. 1997. Annotated checklist of mammals in the Kikori River Basin. *Science in Guinea* 23(2) 79-100.
- McKean, J.L. 1972. Notes on some collections of bats (Order Chiroptera) from Papua New Guinea and Bougainvillea Islands, Australia. CSIRO Division Wildlife Research Technical Paper 26.
- McPhee, E.C. 1988. Ecology and diet of some rodents from the lower montane region of Papua New Guinea. *Australian Wildlife Research* 15: 91-102.
- Mickleburgh, S.P., A.M. Hutson and P.A. Racey. 2002. A review of the global conservation status of bats. *Oryx* 36(1): 18-34.
- Petocz, R.G. 1994. Terrestrial Mammals of Irian Jaya. P.T. Gramedia Pustaka Utama, Jakarta with WWF Indonesia-Programme, 163 p. (*in Indonesian*).
- Polhemus, D.A. and S. Richards. 2002. Geographic overview of Cyclops Mountains and the Mamberamo Basin, pp. 32-37. *In*: Richards, S.J. and S. Suryadi (eds.). A biodiversity assessment of Yongsu-Cyclops Mountains and the Southern Mamberamo Basin, Papua Indonesia. RAP Bulletin of Biological Assessment 25. Conservation International, Washington DC, USA.
- Richards, G.C. 1983. Queensland Blossom-bat, p. 289. *In*: R. Strahan (ed.). *Museum Complete Book of Australian Mammals*. Angus and Robertson, Sydney.
- Singadan, R.K., F. Pattiselanno and Z. Parinding. 2001. The Mammalians on the Lowland Forest of Yongsu, Irian Jaya, pp. 10-12. *In*: Suryadi, S. and E.M. Rosariyanto (eds.). Report on Biology Rapid Assessment Training at Yongsu, Irian Jaya. Conservation International Irian Jaya Program. (*In Indonesian*)
- Vestjens, W.J.M. and L.S. Hall. 1977. Stomach contents of forty-two species of bats from the Australian region. *Australian Wildlife Research* 4: 25-35.
- Wibowo, P. and N. Suyatno. 1998. An overview of Indonesian Wetland Sites II (An update information). Directorate General of Forest Protection and Nature Conservation and Wetlands International Indonesia Programme.
- Wiles, G.J. and M.S. Fujita. 1992. Food plants and economic importance of flying foxes on Pacific islands, pp. 24-35. *In*: Wilson, D.E. and G.L. Graham (eds.). Pacific island flying foxes: Proceedings of an International Conservation Conference, US Fish and Wildlife Service Biological Report 90(23). US Department of the Interior, Fish and Wildlife Service, Washington DC, USA.



ASIA LIFE SCIENCES

The Asian International Journal of Life Sciences

ISSN 0117-3375

D-206 Biological Sciences Building
University of the Philippines Los Baños
College, Laguna 4031
Cellular phone no. (063) 0916-430-8764

©Rushing Water Publishers Ltd., Philippines 2003